

T. A. WATSON.

SIGNALING AND CIRCUIT CONNECTING APPARATUS.

No. 251,807.

Patented Jan. 3, 1882.

Fig:1.

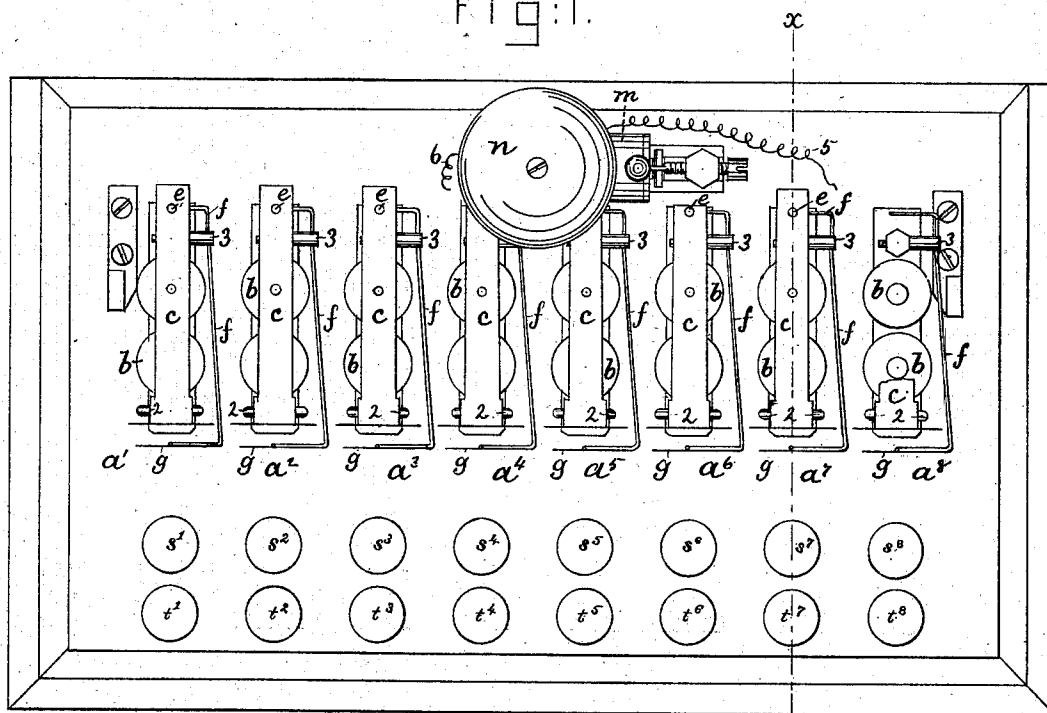
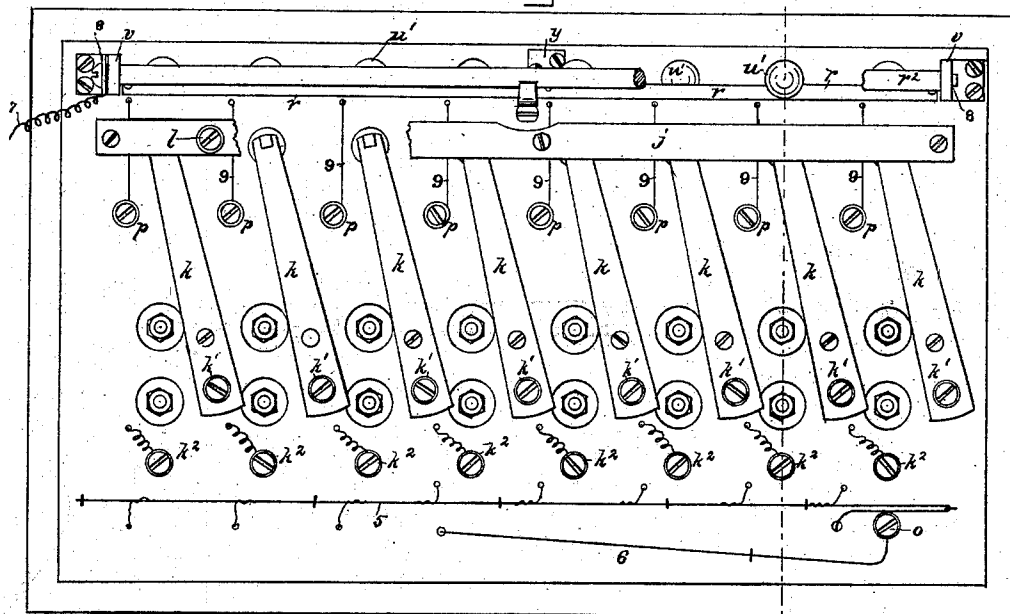


Fig:2.



Witnesses.
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by Crosby & Gregory Attys.

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Fig: 3.

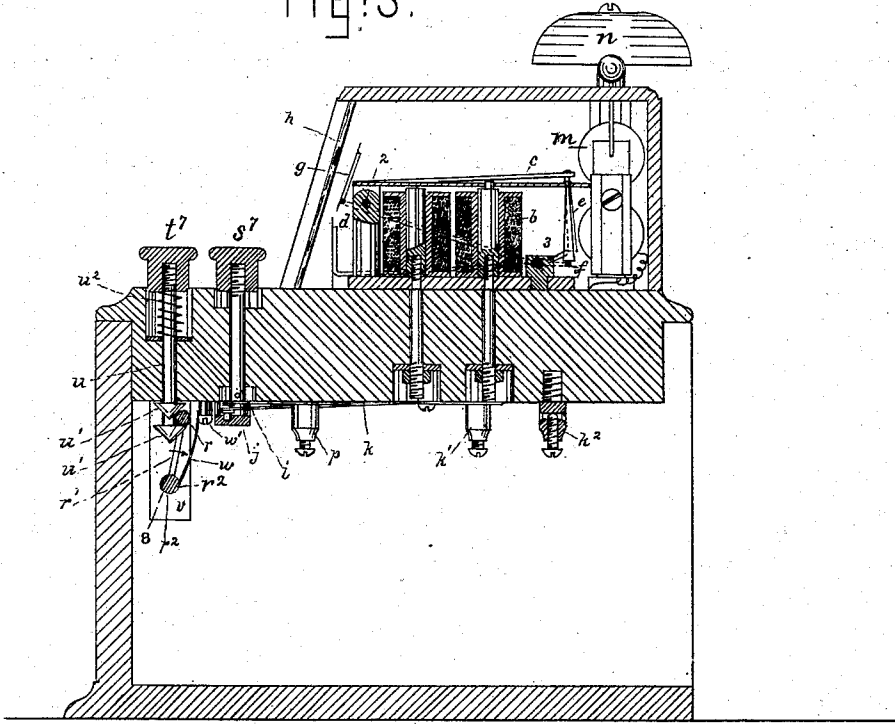
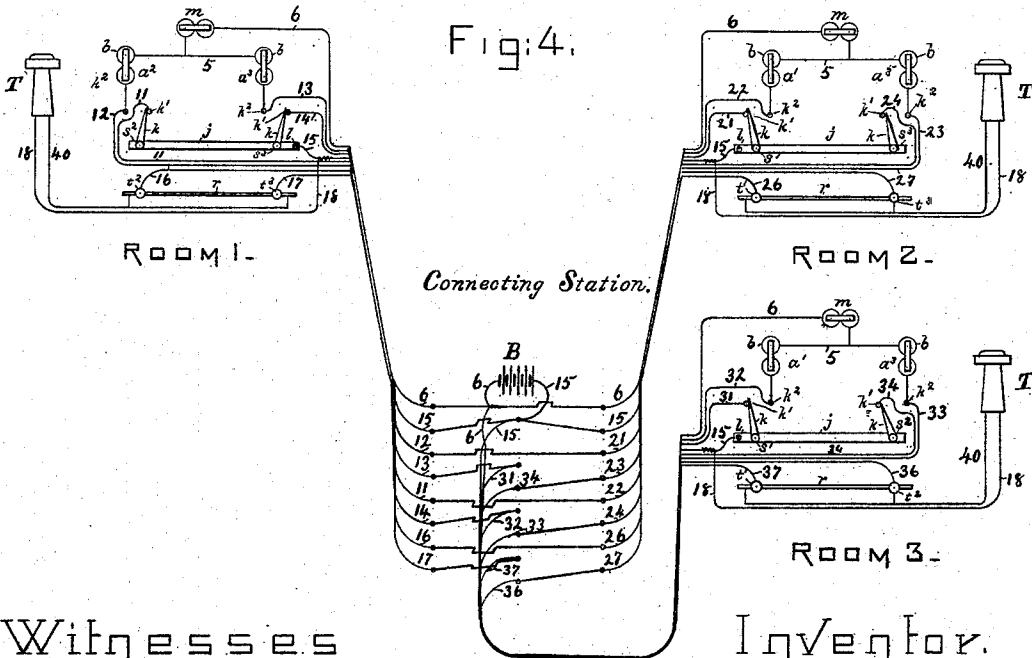


Fig: 4.



Witnesses
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UNITED STATES PATENT OFFICE.

THOMAS A. WATSON, OF EVERETT, ASSIGNOR TO THE AMERICAN BELL
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SIGNALING AND CIRCUIT-CONNECTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 251,807, dated January 3, 1882.

Application filed July 6, 1880. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. WATSON, of
Everett, county of Middlesex, State of Mas-
sachusetts, have invented an Improvement in
5 Signaling and Circuit-Connecting Apparatus,
of which the following description, in connec-
tion with the accompanying drawings, is a
specification.

My invention relates to telephone signaling
10 and communicating apparatus, and has for its
object to enable communication to be estab-
lished between any two of several persons situ-
ated at different points—as, for example, be-
tween the different offices of a corporation or
15 the different individuals of a small community
or rooms of a public building.

The apparatus will be described as employed
for communication between the different offices
of a corporation or rooms of a building; and
20 it consists of a suitable annunciator or signal-
ing and circuit-connecting instrument placed
in each of the said offices or rooms and pro-
vided with annunciator drops and keys, as here-
inafter described.

25 Each annunciator has a number of drops or
signals—one less than the whole number of
rooms—each drop corresponding to one of the
rooms other than the one in which the annun-
ciator is situated. Corresponding to each drop
30 is a key to control an electric circuit passing
through an electro-magnet to operate an an-
nunciator-drop in the room which the drop cor-
responding to the said key indicates. By op-
erating one of the said keys an annunciator-
35 drop is displayed in the room corresponding to
the said key, the said drop indicating in which
room the key was operated, and a person upon
receiving this signal operates his key corre-
sponding to the drop which has just been dis-
40 played, and this key in turn operates the drop
in the room, and corresponding to the key from
which the signal was given, to thus give in-
formation that the signal is received and the
person receiving it is ready to communicate.
45 Corresponding in position to the different keys
last described, which may be called the “signal-
ing-keys,” are a set of “telephone-keys,” so
called, since they control circuits leading to tele-
phonic instruments in the rooms corresponding

to the annunciator-drops last described, so that 50
after one person has operated his signaling or
annunciator key to call up another person, and
has received the return-signal, as hereinbefore
described, the two operators, by depressing tel-
ephone-keys corresponding to the signaling- 55
keys just operated, will place their telephonic
instruments in circuit with one another for tele-
phonic communication. For instance, suppos-
ing there were three rooms. No. 1 would have
two communicating drops, numbered 2 and 3, 60
(or bearing the names corresponding to rooms
2 and 3, as “president’s office,” “secretary’s of-
fice,” &c.,) and two annunciator or signaling
keys corresponding to the said drops, and two
telephone-keys. If the rooms are called “1,” 65
“2,” and “3,” the annunciator of each room
will have drops bearing the numbers of the
other rooms, room 2 having drops 1 and 3 and
room 3 having drops 1 and 2. When the occu-
pant of room No. 1 wishes to signal room 2 or 70
3 he depresses the signaling-key corresponding
to the drop having the number of the room he
desires to signal—as, for example, No. 2, which
operates in room 2, the drop numbered 1 thus
indicating to the operator there that a commu- 75
nication is desired in room 1. This operator
in room 2 will then depress the key correspond-
ing to the drop No. 1 he has just seen operated,
and will thus operate in room 1 the drop No. 2.
An alarm or signal bell is placed in the com- 80
mon circuit leading from all the drop-operat-
ing electro-magnets of each annunciator to the
battery or electric generator used, so that simul-
taneously with the movement of the drop to in-
dicate from what room a signal is received an 85
audible signal is given to call attention to the
annunciator. It will be seen that by this ar-
rangement electric conductors or wires must
pass from each room to every other room, so
that if the rooms are supposed to be situated 90
at the angles of a polygon and the necessary
connections made directly from one point to
another the electric conductors or wires would
pass over lines representing all the sides and
diagonals of the said polygon, thus forming a 95
complicated net-work difficult to establish and
maintain. I have avoided this difficulty and
confusion by leading all the conductors from

each room inclosed in a cable, or otherwise compactly arranged, to a central point, where all the cross-connections between the wires of the different rooms are made, and where the batteries or electric generators employed may be placed.

Figure 1 is a top view of an annunciator such as may be employed to carry out my invention, part of the inclosing-case being removed; Fig. 2 an under side view thereof; Fig. 3, a transverse section on line $x x$, Figs. 1 and 2, and Fig. 4, a diagram showing the arrangement of circuits employed for connecting different instruments, three only being indicated, for the sake of simplicity.

As herein shown eight drops, with the corresponding signaling and telephone keys, are employed, such instruments being adapted for use with any number of rooms or points of communication less than ten, one of them being placed in each room.

The annunciator-drops a' a^2 a^3 , &c., and their operating electro-magnets b , are or may be of any usual construction. As herein shown they are of the kind invented by me and described in a previous application, to which reference may be had.

The armatures c , having one end pivoted at 2 on a supporting-post, d , are provided at their other end with a rod, e , resting on the end of the short arm of a lever, f , pivoted at 3, and carrying at its other end the indicating-signal g . When an electro-magnet, b , is magnetized the armature c is drawn down thereon, as shown in Fig. 3, the rod e depressing the short arm of lever f and raising the long arm thereof and the connected visible signal g to bring the said signal in front of an opening, h , in the inclosing-case. (See Fig. 3.)

In front of the annunciator-drops a' a^2 a^3 are placed corresponding signaling-keys, s' s^2 , &c., each adapted to close an electric circuit leading to an electro-magnet, b , operating a drop in the room bearing the name or number corresponding to the drop opposite or in front of which the said key is placed. These keys operate as follows: The finger keys or buttons s' s^2 are connected with stems i bearing on the free ends of springs k , fastened at their other ends to the frame-work, and provided with binding-screws l' , to be connected with the binding-screws k^2 in the other instrument. Any one of the springs k is brought by depressing one of the buttons s' s^2 , &c., above it into contact with the common anvil j , provided with a binding-screw, l , to be connected with one pole of the battery. The operation of this part of the apparatus is as follows: Supposing the operator in the room containing the instrument illustrated in Figs. 1, 2, 3, and which may be called "room 9," desires to call an operator in the room No. 7, or corresponding to and indicated by the annunciator-drop a^7 , he will depress the key s^7 , opposite the said drop, and thus close the circuit between the anvil j , connected with one pole of the battery and the spring k , the said circuit

passing from said spring k by the wire connected with the binding-screw l' thereon to one of the binding-screw k^2 of the similar instrument in room 7, whence it passes through the coils of the drop-magnet b to operate the signal g to the wire 5, connected with and common to all the magnets b , and passing through the magnet m of the signal-bell n to the wire 6 and binding-screw o connected with the other pole of the battery, thus magnetizing the said magnets b m , raising the indicating-signal g , and sounding the bell n . If the numbers of the drops a' a^2 , &c., are supposed to be the same as the rooms they indicate, the key s^9 , corresponding to the drop a^9 of the instrument just operated in room 7, will close the circuit through the magnet b of the drop a^7 and the magnet m of room 9 in a similar manner. In the same way the key s' is connected to operate a drop, a^9 , in room No. 1, where the corresponding key will operate drop a' of room 9, and so on, each instrument containing drops having the names or numbers of all the other rooms, and each of the keys corresponding to the said drops operates a drop bearing the number of the room in which the said key is situated—in the room having the number of and indicated by the drop corresponding to the said key.

The telephone-keys t' t^2 , &c., in front of and corresponding to the signal-keys s' s^2 , &c., are each connected with one of the binding-screws p and a wire leading therefrom to the corresponding binding-screws p and connected keys t^9 in the other rooms. The key of each room is connected to the key in another room opposite to the annunciator-drop bearing the number of the room in which the first mentioned key is situated—as, for example, key t^2 of room 6 is connected with key t^6 of room 2. All the said telephone-keys of one instrument have a common anvil, r , of peculiar construction, as hereinafter described, connected by wire 7 with one electrode or terminal of the telephonic instruments used in connection with the said signaling-instrument, these telephonic instruments in all the different rooms having a common return circuit wire connected with their other terminal. After a signal has been given and a return-signal received by the signaling-keys, as last described, the corresponding telephone-keys are depressed, the key t^7 connecting one electrode or terminal of the telephonic instruments in the room 9 with the binding-screw p and wire leading to the key t^9 in room 7, and the said key t^9 , when depressed, continuing the circuit to the anvil r and one electrode or terminal of the telephonic instrument in room 7, the other electrodes of the said instruments in rooms 9 and 7 being connected by the common return-circuit wire, as before described, so that the circuit is now in proper condition for communication between the said rooms 9 and 7.

The telephone-keys t' t^2 , &c., are provided with metallic stems u , terminating in conical heads u' , and are normally held elevated by

5 springs u^2 out of contact with the anvil r , which consists of a rod connected by cross-bars r' with a shaft, r^2 , pivoted at 8 in brackets v connected with the frame-work. The connected
 10 rod r and shaft r^2 form a frame adapted to be swung on the pivots 8 in the direction of the arrow, Fig. 3, the said frame being provided with a spring, w , bearing against a stop, w' , on the frame-work, and tending to retain the
 15 said frame pressed against a stop, y , on the frame-work. (See Fig. 2)

Each key t' , t^2 , &c., is connected by wire 9 with one of the binding-screws p , and when one of the said keys is depressed its conical
 20 head w' wedges the rod r aside, the spring w then yielding until the said head arrives at a point below the rod r , when the spring w throws the said rod back over the head w' to retain it and the connected key in its depressed condition, and thus form electric connection between the binding-screw p and the said anvil
 25 r and wire 7 attached thereto. When the operators in two rooms have each depressed the telephone-key connected with the wire leading to the other of said rooms the telephonic circuit will be closed between the said rooms and will remain so, the keys being retained depressed by the rods r engaging the heads w' . Communication may then be carried on without further care on the part of the operators.
 30 If one of the telephone-keys is already depressed, and the operator depresses another one, the latter will move the rod r aside and release the head w' of the one previously depressed, which will then be raised by the spring u^2 , so that two telephone-keys will not remain depressed at the same time unless it might for some reason be desirable to connect more than two points, in which case the proper keys could
 35 be depressed simultaneously, or one held down while the other was being moved down and engaged by the rod r . A key previously held down will be disengaged upon the depression of another before the latter is itself engaged, so that by the proper manipulation all the keys may be left open; but it will do no harm to leave the key down until a different connection is desired, when the said key will be released by the one making the new connection.

40 The method of making the necessary connections is illustrated in Fig. 4, where three rooms are shown provided with instruments similar to the one shown in the other figures, the said rooms being called 1, 2, and 3.

45 The instrument in each room will be provided with indicator-drops marked to indicate the other rooms—as, for example, room 1 will be provided with indicator-drops 2 and 3 to indicate that a signal is received from rooms
 50 2, 3, respectively. The corresponding keys, s^2 , s^3 , will control the drops a' in rooms 2 and 3, and the telephone-keys t^2 , t^3 will connect the telephone-T, room 1 with the key t' in rooms 2 and 3. In a similar manner the instrument in
 55 room 2 will contain drops and keys marked 1 and 3, and connected with rooms 1 and 3, respectively, and so on, for as many rooms and

instruments as there may be. All the wires from each room are led together, being preferably inclosed in a cable, to a common point, 70 where the proper connections between the wires from the different rooms are made, and where the battery B for operating the signaling-magnets b and m is placed, it having one pole connected with the wire 6 branching and leading to all the instruments, at each of 75 which it passes through the magnet m and is connected with the wire 5.

From the wires 5 in each instrument branch wires lead to the binding-screws k^2 , which are 80 connected by the wires 12 13 22 23 32 33, leading to the connecting-station, and there connected with wires leading to the binding-screws k' and springs k , operated by the keys s' , s^2 , &c., in the other instruments. These springs k 85 are normally separated from their anvils j , which are connected at each instrument by the binding-screw l with a common return-wire, 15, leading to the other pole of the battery B.

If desired, the anvils j and the connected pole of the battery might be grounded instead of using the return-wire, and the latter, if used, will also be used as the return-wire for the telephone-circuits, and should be of very 90 low resistance to prevent dividing of the currents in case more than one telephonic circuit is closed at a time.

The wires 12 13 from the magnets b of the drops a^2 , a^3 in room 1 are connected at the connecting-station with the wires 21 31, respectively, leading to the springs k of the signaling-keys s' in rooms 2 and 3, respectively, and the wires 22 and 23 from drops a' , a^3 , room 2, are connected with the wires 11 34, leading to the keys s^2 in rooms 1 and 3, and the wires 32 33 from drops a' , a^2 in room 3 are connected with the wires 14 24, leading to the keys s^3 in rooms 1 and 3.

The telephonic instrument in each room 110 (shown as the usual hand-telephone T) have one electrode connected by wire 40 with the anvil r of the telephone-keys t' , t^2 , &c., and the other electrode connected by wire 18 with the ground or common return-wire 15, hereinbefore described. Usually the secondary coil of a battery-transmitter will be included in the circuit of wire 18 or 40.

The telephone-keys t' , t^2 , &c., of each instrument, normally separated from their anvils r , 120 are connected with the telephone-keys of the other instruments, as follows: Key t^2 in room 1 is connected by wire 16 with wire 26, leading to and connected with key t' in room 2, and key t^3 in room 1 by wire 17 with wire 37, 125 and key t' in room 3 and key t^3 in room 2 by wire 27 with wire 36 and key t^2 in room 3.

The signaling devices or annunciator-drops a' , a^2 , &c., will preferably be marked at the opening h , Fig. 3, through which the signal g 130 is displayed, with the name of the room the said drop indicates for, which is also the room which is connected with the signaling and telephone keys in front of the said drop.

The operation is as follows: Supposing an operator, as in room 1, wishes to communicate with a person in room 2, he will depress the signaling-key s^2 in front of the drop or signaling device a^2 , marked with the name of the room of which he desires to signal an occupant. This will close the circuit from one pole of the battery through the branch of the return-wire 15 leading to room 1, and the anvil j therein to the spring k , operated by the said key s^2 , from which the circuit will be completed by wires 11 and 22, and through the magnet b of the drop a' in room 2, and thence by wire 5 to and then through the magnet m , and by wire 6 to the other pole of the battery, thus magnetizing the said magnets b and m to operate the drop a' in room 2 and sound the signal bell n . If the operator in room 1 had depressed the key s^3 , the drop a' would have been similarly operated in room 3. The occupant of room 2, upon hearing the sound of the bell, turns to the signaling-instrument, and upon seeing the signal g displayed at the opening marked 1 knows that he is called from room 1 and accordingly depresses the key s' in front of the said signal, thereby closing the circuit through wires 21, 12, 5, 6, and 15, and the magnet b of drop a^2 and magnet m in room 1 indicating in the said room that a signal (in this case the return-signal) is received from room 2. The operators in rooms 1 and 2 then depress the telephone-keys t^2 and t' , respectively, in front of the drop just operated, and thus close the telephonic circuit for talking between the said rooms, the said circuit being as follows: from one binding-screw of the telephone T in room 1 by wire 40 to the anvil r , and thence from the key t^2 , connected therewith by wires 16 and 26 to key t' , and the anvil r in room 2, and thence by wire 40 through the telephone T, returning by wires 18, 15, and 18 to the other binding-screw of the telephone in room 1. By this arrangement it will be seen that the telephonic circuit is confined between the points connected by corresponding telephone keys, and that while the occupants of two rooms are communicating a third one cannot in any way overhear, except when it is intended that he shall, in which case the keys connected, with his room will also be depressed.

The return-wire 15, when used instead of a ground, is of sufficient conductivity to prevent any material portion of the currents from passing through a second telephonic circuit, if closed, so that when there is a considerable number of different points connected conversation may be carried on between different pairs of them simultaneously without any interference or confusion.

I claim—

1. A series of three or more signaling-instruments, comprising each a set of signal-keys and signaling devices connected with one another, as indicated—that is to say, the signal-keys in one instrument being connected with signal-devices in the other instruments,

a separate key with each signal device, whereby a signal can be given from any of said instruments at any other by means of the appropriate signal-key, which signal will indicate whence it is sent, and a return-signal can in like manner be given, substantially as described.

2. A series of three or more telephone signaling-instruments, comprising signal-keys, telephone-keys, and signal devices, and electrically connected, as indicated—that is to say, the signal keys and devices in each instrument being connected with corresponding devices and keys in others, a separate key to each signal device, and the telephone-key in each instrument being similarly connected with the telephone-keys in other instruments, substantially as described.

3. Sets of telephone-keys having a common anvil for each set, in combination with telephones, conductors connecting the telephones with said anvils and with the ground or a return wire or wires, and conductors connecting the keys with one another, and the keys in each set with keys in all the other sets, substantially as described.

4. The combination, with a series of spring-keys, of a common anvil and means, as indicated, for retaining the keys in contact with said anvil, whereby when a key or keys are depressed they are automatically engaged, and when a key or keys are subsequently depressed they are engaged and the keys formerly depressed are automatically disengaged, substantially as described.

5. A series of signaling and circuit-connecting instruments at different stations, each provided with a series of signal-keys and a corresponding series of signaling-devices, to give and to receive characteristic signals at and from the other instruments of the series, and also provided with a series of telephone-keys corresponding to the said signaling keys and devices, each telephone-key of the instrument at one station having electrical connections, as explained, so as to close a circuit through telephonic instruments at the said station to a corresponding telephone-key in the instrument at another station, each of the two connected telephone-keys corresponding in position with the signaling key and device of the said instrument devoted to signaling between the said two connected stations, whereby the operators, after signaling one another, by operating the proper signaling-keys, may be placed in telephonic communication by operating the telephone-keys corresponding to the said signaling-keys, substantially as described.

6. In an electrical system having a series of three or more stations connected with one another, the herein-described arrangement of wires leading from the several stations to a central point or station, where they are permanently connected with the wires leading to other stations, substantially as described.

7. In a signaling and circuit-connecting instrument, the combination of the following ele-

ments: a series of annunciator-drops or indicating-signals to indicate from what point a communication is desired, a series of signaling-keys corresponding thereto, and a series of
5 telephone-keys corresponding to the indicating signals and keys, substantially as and for the purpose set forth.

8. A series of circuit-controlling keys connected with a series of independent telephonic
10 circuits and a common anvil constructed, as explained, so as to engage and hold any one of the said keys when depressed, and to be disengaged therefrom when operated by the depression of a second key, the said anvil be-

ing connected with one electrode of a tele- 15
phonic instrument having its other electrode connected with the ground or a return-circuit common to all the said independent telephonic
circuits, substantially as and for the purpose
described. 20

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS A. WATSON.

Witnesses:

JOS. P. LIVERMORE,
N. E. C. WHITNEY.